Fact Sheet

Deployment of Improved Technologies for Cleanout of the F Reactor Fuel Storage Basin

Hanford Site in Partnership with the Office of Science & Technology

Introduction

The Hanford Site's F Reactor Fuel Storage Basin (FSB) is a large reinforced concrete basin that once served as a collection, storage and transfer facility for irradiated fuel elements discharged from the reactor. Following F Reactor shutdown, and in preparation for decommissioning, some of the fuel storage baskets were removed, structural and operational systems were disassembled and the water level in the FSB was reduced to a depth of approximately 0.9 m (3 ft.). The decking was dropped into the basin, along with the monorail's steel sections and other miscellaneous items. The FSB was then filled to the top with local surface material (aggregate to fine sand). The F Reactor FSB situation is comparable to a typical buried waste site. The proposed D&D approach for cleanout of the FSB capitalizes on the remote-operation and data-generating capabilities of advanced technologies and equipment to minimize health and environmental risks while accelerating clean up at a reduced cost.

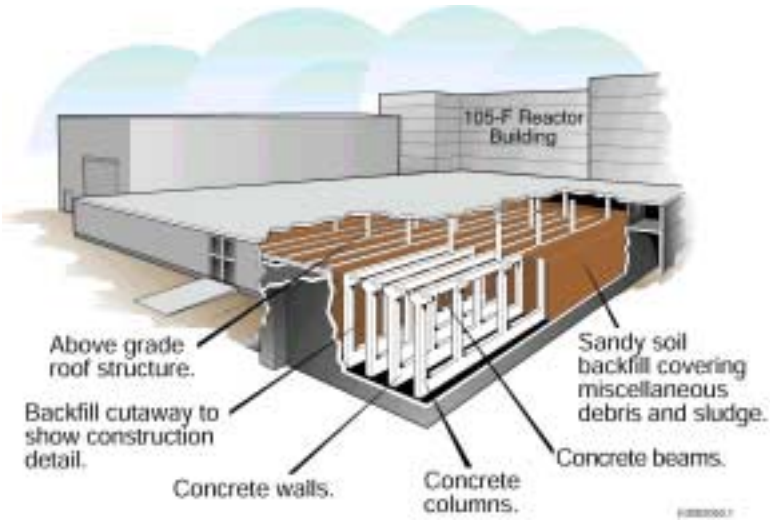

Figure 1. F Reactor FSB Construction Detail.

To enhance Hanford's cleanup efforts, the Environmental Management's Office of Science and Technology (OST) is providing $750K of funding (FY01) to deploy improved D&D technologies. The Environmental Restoration Project has committed $3.2M to the effort.

Technical Need

Cleanout of the F Reactor FSB is a key step in completing the Paths to Closure for the Hanford Site. The F Reactor FSB has some complex technical issues and unique challenges, including identification, removal, and disposal of miscellaneous irradiated/contaminated debris that is potentially interspersed with pieces of spent fuel elements buried under 6.1 m (20 ft.) of sandy soil. Broadly, the technical needs associated with the project include: 1) Characterization, 2) Backfill Removal & Segregation, and 3) Material Removal & Segregation.

History and preliminary characterization information indicate that the top 5.2 m (17 ft.) of fill should be free of radiological or chemical contamination, and that most of the debris is expected to be found primarily in the bottom 15% of the basin.

System Description

To meet the needs of the project, the ASTD approach leverages three technologies to locate, map, and ultimately remove fuel elements, equipment, and debris from the FSB. The integrated approach/system will methodically and remotely map, fingerprint and remove fuel and high-dose materials. Deploying the technologies offers the potential for significant reductions in radiation dose, operational risk, and cost expenditures while meeting project objectives. The technology suite includes:

- The GammaCam™, which provides a pseudo-color image of gamma-ray radiation fields superimposed on a black-and-white visual image of the target. The recently developed GammaModeler™ system, which displays results as combined 3-D representations of the radiation sources and the environment. These imaging systems provide a means to remotely locate high-intensity gamma radiation sources buried in the F Reactor FSB. Accurate dose assessments performed from a

distance are advantageous from an ALARA perspective.

- The In Situ Object Counting System (ISOCS™) is a portable in situ Germanium-based spectrometry system that is designed to provide information on types and quantity of radioactive material. It will allow "fingerprinting" to identify irradiated fuel pieces prior to excavation. This capability is valuable in addressing ALARA concerns, and in supporting project planning for packing, transporting and processing materials as they are excavated.

- The Brokk™ 330N is a commercially available remotely controlled work platform that can be configured with a flexible array of attachments. The Brokk™ work platform will be used for deployment of characterization sensors, and for remote fine and bulk excavation in the FSB. The unit's remote operations capability (shears, manipulators, and an excavator) moves personnel further away from source terms, thereby lowering dose and minimizing radioactive airborne problems.

Benefits

A comparison of the proposed approach and the baseline approach (i.e., excavation equipment, semi-remote detectors, and remote visual inspection) confirms that the proposed approach offers significant improvements in ALARA performance, risk management, and operational quality while providing cost and schedule benefits. In addition, the proposed approach offers significant technical advantages that include the following:

- Greatly improves the characterization and precise location of source-term materials.
- Minimizes personnel radiation dose issues and lowers the dose commitment by a factor of 30 to 40.
- The systems support ALARA objectives, reduce risks, and improve detail planning for removal, packaging, and transporting.
- Minimizes uncertainties, facilitates planning, and reduces the need for contingency planning for labor material costs.
- Decreases airborne-radioactivity concerns.
- Minimizes regulatory concerns.

OST's contributions to the effort will enable completion of the basin cleanout in FY01 instead of FY03, which was the baseline schedule in the Site's Long-Range Plan. In addition, this approach is estimated to save approximately $2M over the baseline/long-range plan.

This suite of technologies also has future applications at the Hanford H Reactor FSB, as well as for general site-wide decontamination and decommissioning (D&D), and for buried waste site remediation across the DOE complex. Further, this "strategy" represents a potential solution for 16 D&D technology needs statements published by seven other DOE sites.

Status

The regulatory documentation, conceptual engineering, and planning for F FSB D&D were initiated in October 1999. Characterization planning, regulatory approvals and definitive engineering was completed in FY00. Preparation of equipment specifications and purchasing was initiated in FY00 allowing for technology deployments in the second quarter of FY01. The F FSB D&D work activities should be complete at the end of FY01.

For more information about technology deployments & cleanout of the F Reactor FSB

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